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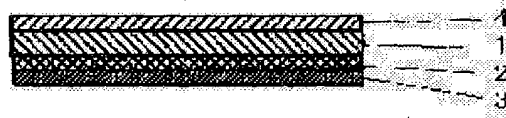
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(54) LIQUID CRYSTAL CELL SUBSTRATE

(57)Abstract:

PROBLEM TO BE SOLVED: To develop a liquid crystal cell substrate having a polarizing function which can form a liquid crystal cell substrate having excellent thin and lightweight property, heat resistance, shock resistance and stability in the quality.

SOLUTION: The liquid crystal cell substrate is produced by tightly laminating at least a gas barrier layer 2, a crosslinked resin layer 3 and a polarizing layer 4 on a resin substrate 1, and the polarizing layer consists of a coating layer. By this method, the polarizing layer which is thin and excellent in heat resistance can be added by a coating method on the resin substrate and also the gas barrier layer and the crosslinked resin layer are easily added. The substrate can be efficiently produced, and the obtained substrate is excellent not only in the moisture resistance, gas resistance and shock resistance but in thin light-weight property and heat resistance. The obtained liquid crystal cell substrate has a polarizing function and high durability with which a liquid crystal having excellent long-term stability of the display quality can be formed.



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(54) 【発明の名称】 液晶セル基板

(57) 【要約】

【課題】 薄型軽量性と耐熱性に優れ、かつ耐衝撃性や品質の安定性に優れる液晶セル基板を形成できる偏光機能を有する液晶セル基板の開発。

【解決手段】 樹脂基板 (1) に少なくともガスバリア層 (2) と架橋樹脂層 (3) と偏光層 (4) を密着付設してなり、その偏光層が塗工層からなる液晶セル基板。

【効果】 樹脂基板に塗工方式にて薄さと耐熱性に優れた偏光層を付与でき、ガスバリア層や架橋樹脂層も容易に付与できて効率よく製造でき、耐湿・耐ガス性や耐衝撃性に加え薄型軽量性や耐熱性にも優れて、表示品位の長期安定性に優れる液晶セルを形成しうる、偏光機能を有する高耐久性の液晶セル基板が得られる。



【特許請求の範囲】

【請求項1】 樹脂基板に少なくともガスバリア層と架橋樹脂層と偏光層を密着付設してなり、その偏光層が塗工層からなることを特徴とする液晶セル基板。

【請求項2】 請求項1において、樹脂基板が熱硬化エポキシ系樹脂からなる液晶セル基板。

【請求項3】 請求項1又は2において、偏光層の厚さが5 μ m以下である液晶セル基板。

【請求項4】 請求項1～3において、偏光層がリオトロピック液晶性の二色性色素、二色性染料含有の液晶ポリマー層又は二色性染料含有のリオトロピック性物質からなる液晶セル基板。

【請求項5】 請求項1～4において、偏光層が樹脂基板の片面に隣接する、又はガスバリア層と架橋樹脂層の間に位置する液晶セル基板。

【発明の詳細な説明】**【0001】**

【発明の技術分野】本発明は、耐熱性や耐湿性、ガスバリア性や耐久性、薄型軽量性等に優れて液晶表示装置の形成に好適な偏光機能を有する樹脂系の液晶セル基板に関する。

【0002】

【従来の技術】従来、偏光機能を有する液晶セルとしては、セル基板に偏光フィルム系の偏光板を接着積層したものが知られていた。そのセル基板には大画面化に伴い重くて割れやすいガラス基板に代えて薄型軽量性に優れた樹脂基板を用いる提案もあるが、その場合にても前記の偏光板が偏光フィルムの両面に接着層を介し透明保護フィルムを付設してなる五層構造を有して通例100 μ m以上の総厚であるため、軽量性に加えて薄型性も十分に活かされず、また偏光フィルムの耐熱性不足で100℃以上での使用が困難な問題点があった。

【0003】

【発明の技術的課題】本発明は、薄型軽量性と耐熱性に優れ、かつ耐衝撃性や品質の安定性に優れた液晶セル基板を形成できる偏光機能を有する液晶セル基板の開発を課題とする。

【0004】

【課題の解決手段】本発明は、樹脂基板に少なくともガスバリア層と架橋樹脂層と偏光層を密着付設してなり、その偏光層が塗工層からなることを特徴とする液晶セル基板を提供するものである。

【0005】

【発明の効果】本発明によれば、樹脂基板に塗工方式にて薄さと耐熱性に優れた偏光層を付与でき、ガスバリア層や架橋樹脂層も容易に付与できて効率よく製造でき、耐湿・耐ガス性や耐衝撃性に加え薄型軽量性や耐熱性にも優れて、表示品位の長期安定性に優れた液晶セルを形成しうる、偏光機能を有する高耐久性の液晶セル基板を得ることができる。

【0006】

【発明の実施形態】本発明による液晶セル基板は、樹脂基板に少なくともガスバリア層と架橋樹脂層と塗工層からなる偏光層を密着付設したものからなる。その例を図1、図2に示した。1が樹脂基板、2がガスバリア層、3が架橋樹脂層、4が偏光層である。

【0007】樹脂基板は、ガスバリア層等の付設層を支持するセル基板のベースとなるものであり、熱可塑性樹脂や熱硬化性樹脂などの適宜な樹脂にて形成することができる。偏光層や透明導電膜等を付設する際の耐熱性などの点より好ましく用いうる樹脂基板は、ガラス転移温度が130℃以上、就中150℃以上、特に160℃以上の樹脂からなるものである。

【0008】また樹脂基板は、透明性や耐衝撃性に優れることが好ましく、特に光透過率が80%以上であるものが好ましい。さらに液晶の変質防止や液晶セルとした場合の耐久性などの点より耐薬品性や光学的等方性、低吸水性や低透湿性、酸素等のガスバリア性に優れたものが好ましい。

【0009】樹脂基板の形成に用いられる樹脂の例としては、ポリカーボネートやポリアリレート、ポリエーテルスルホンやポリエステル、ポリスルホンやポリメチルメタクリレート、ポリエーテルイミドやポリアミドの如き熱可塑性樹脂、エポキシ系樹脂や不飽和ポリエステル、ポリジアリルフタレートやポリイソボルンメタクリレートの如き熱硬化性樹脂などがあげられる。かかる樹脂は、1種又は2種以上を混合して用いることができる。

【0010】上記した性能の点より好ましく用いうる樹脂基板は、エポキシ系樹脂からなるものである。そのエポキシ系樹脂としては種々のものを用いることができ、特に限定はない。ちなみにその例としては、ビスフェノールA型やビスフェノールF型、ビスフェノールS型やそれらの水添型の如きビスフェノール型、フェノールノボラック型やクレゾールノボラック型の如きノボラック型、トリグリシジルイソシアヌレート型やヒダントイン型の如き含窒素環型、脂環式型や脂肪族型、ナフタレン型の如き芳香族型やグリシジルエーテル型、ビフェニル型の如き低吸水性タイプやジシクロ型、エステル型やエーテルエステル型、それらの変性型などがあげられる。

【0011】透明性等の光学特性などの点より好ましく用いうるエポキシ系樹脂は、脂環式型のものの如くベンゼン環等の共役二重結合を含有せずに変色防止性の良好なものである。また通例、エポキシ当量が100～1000で、軟化点が120℃以下のエポキシ系樹脂が、得られる樹脂基板の柔軟性や強度等の物性などの点より好ましく用いうる。エポキシ系樹脂は、1種又は2種以上を用いることができ、液状と固形状のエポキシ系樹脂を併用することもできる。固形エポキシ系樹脂の併用で強度や耐熱性の向上を図ることができる。

【0012】耐熱性等の点より特に好ましいエポキシ系樹脂からなる樹脂基板は、例えば脂環式エポキシ系樹脂と酸無水物系硬化剤とリン系硬化触媒を含有するエポキシ系組成物の加熱硬化体の如く、エポキシ系樹脂を硬化剤を介して熱硬化処理したものである。その硬化剤については特に限定はなく、エポキシ系樹脂に応じた適宜な硬化剤を1種又は2種以上用いることができる。

【0013】ちなみに前記硬化剤の例としては、テトラヒドロフタル酸やメチルテトラヒドロフタル酸、ヘキサヒドロフタル酸やメチルヘキサヒドロフタル酸の如き有機酸系化合物類、エチレンジアミンやプロピレンジアミン、ジエチレントリアミンやトリエチレントトラミン、それらのアミンアダクトやメタフェニレンジアミン、ジアミノジフェニルメタンやジアミノジフェニルスルホンの如きアミン系化合物類があげられる。

【0014】またジシアンジアミドやポリアミドの如きアミド系化合物類、ジヒドラジットの如きヒドラジド系化合物類、メチルイミダゾールや2-エチル-4-メチルイミダゾール、エチルイミダゾールやイソプロピルイミダゾール、2,4-ジメチルイミダゾールやフェニルイミダゾール、ウンデシルイミダゾールやヘプタデシルイミダゾール、2-フェニル-4-メチルイミダゾールの如きイミダゾール系化合物類も前記硬化剤の例としてあげられる。

【0015】さらにメチルイミダゾリンや2-エチル-4-メチルイミダゾリン、エチルイミダゾリンやイソプロピルイミダゾリン、2,4-ジメチルイミダゾリンやフェニルイミダゾリン、ウンデシルイミダゾリンやヘプタデシルイミダゾリン、2-フェニル-4-メチルイミダゾリンの如きイミダゾリン系化合物類、その他、フェノール系化合物類やユリア系化合物類、ポリスルフィド系化合物類も前記硬化剤の例としてあげられる。

【0016】加えて酸無水物系化合物類なども前記硬化剤の例としてあげられ、低刺激性による作業環境性や得られる硬化層の耐熱性向上による高温耐久性、変色防止性などの点よりは、かかる酸無水物系硬化剤が好ましく用いられる。その例としては無水フタル酸や無水マレイン酸、無水トリメリット酸や無水ピロメリット酸、無水ナジック酸や無水グルタル酸、テトラヒドロフタル酸無水物やメチルテトラヒドロフタル酸無水物、ヘキサヒドロフタル酸無水物やメチルヘキサヒドロフタル酸無水物、メチルナジック酸無水物やドデセニルコハク酸無水物、ジクロロコハク酸無水物やベンゾフェノンテトラカルボン酸無水物やクロレンジック酸無水物などがあげられる。

【0017】就中、無水フタル酸やテトラヒドロフタル酸無水物、ヘキサヒドロフタル酸無水物やメチルヘキサヒドロフタル酸無水物の如く無色系ないし淡黄色系で、分子量が約140～約200の酸無水物系硬化剤が好ましく用いられる。

【0018】硬化剤の使用量は、その種類やエポキシ系樹脂のエポキシ当量などに応じて適宜に決定でき、通例のエポキシ系樹脂硬化の場合に準じうる。ちなみに前記の酸無水物系硬化剤では、得られる硬化層の色相や耐湿性の低下防止などの点よりエポキシ基1当量に対し、0.5～1.5当量、就中0.6～1.4当量、特に0.7～1.2当量の割合で酸無水物系硬化剤を使用することが好ましい。なお他の硬化剤を単独で又は2種以上を併用して使用する場合にも、その使用量は前記の当量比に準じうる。

【0019】エポキシ系樹脂の硬化処理に際しては、必要に応じて硬化促進剤を用いることができる。その硬化促進剤については特に限定はなく、エポキシ系樹脂や硬化剤の種類などに応じて例えば、第三級アミン類やイミダゾール類、第四級アンモニウム塩類や有機金属塩類、リン化合物類や尿素系化合物類の如き適宜なものを1種又は2種以上用いることができる。硬化促進剤の使用で硬化速度を促進して必要硬化処理時間を短縮することができる。従って硬化促進剤の使用量は、促進効果などに応じて適宜に決定しうるが、一般には変色防止性などの点よりエポキシ系樹脂100重量部あたり、0.05～7重量部、就中0.1～5重量部、特に0.2～3重量部が好ましい。

【0020】樹脂基板の形成は、例えばキャスト成形方式や流延成形方式、射出成形方式やロール塗工成形方式、押出成形方式やトランスファ成形方式、反応射出成形方式(RIM)などの適宜な方式で行うことができる。その形成に際しては、必要に応じて例えば染料や変性剤、変色防止剤や酸化防止剤、紫外線吸収剤や離型剤、反応性希釈剤や非反応性希釈剤などの適宜な添加剤を透明性を損なわない範囲で適宜に配合することができる。

【0021】エポキシ系樹脂からなる樹脂基板の量産性に優れる製造方法は、例えば配合成分を必要に応じ溶媒を併用して流動展開しうる状態に調製したエポキシ系樹脂塗工液を、カーテンコート法やロールコート法、ワイヤバーコート法やエクストルージョンコート法、スプレコート法などの適宜な方式でエンドレスベルトやドラム等の支持体上にシート状に展開して硬化処理する方法である。

【0022】前記の方法によればエポキシ系樹脂からなる樹脂基板上を連続製造することができる。その場合、支持体上に形成されたエポキシ系樹脂基板の回収は、例えば支持体上に予め易剥離性の樹脂層等を形成してその上にエポキシ系樹脂基板を設けることにより達成でき、その場合に樹脂基板上に設ける架橋樹脂層やガスバリア層などを易剥離性樹脂層として設けることにより本発明による液晶セル基板を効率よく形成することができる。

【0023】上記したエポキシ系樹脂塗工液の調製に際しては、塗工性やシート状への展開性等の点より塗工時

の温度以下、特に常温において液体状態を示す二液混合型のエポキシ系樹脂が好ましく用いられ、その場合に固形エポキシ系樹脂を併用して塗工液の粘度を調節でき、塗工液の高粘度化で展開層の厚さ制御などを容易化することもできる。

【0024】なおエポキシ系樹脂塗工液には、例えば上記した酸無水物系硬化剤に対するアルキルホスフィン類やホスフィンオキサイド類、ホスホニウム塩類等のリン系硬化触媒の如き硬化触媒、表面の平滑化を目的に例えばシリコン系やアクリル系、フッ素系等の各種界面活性剤などの表面張力を低下させる適宜なレベリング剤の1種又は2種以上を必要に応じ配合することができる。

【0025】また例えばフェノール系やアミン系、有機硫黄系やホスフィン系等の老化防止剤、グリコール類やシリコン類、アルコール類等の変性剤、グリセリンの如き多価アルコール類等の発泡防止剤や水酸基含有化合物、染料や変色防止剤、紫外線吸収剤などのエポキシ系樹脂硬化体に配合されることのある適宜な添加剤も必要に応じて配合することができる。

【0026】樹脂基板の厚さは、適宜に決定しうるが一般には、薄型化や軽量化、強度や変形防止性などの点より1mm以下、就中800 μ m以下、特に100～500 μ mが好ましい。また表示品位等の点よりは厚さ精度に優れることが好ましく、就中 $\pm 10\%$ 以下の厚さ精度であることが好ましい。なお樹脂基板は、単層物や同種又は異種の樹脂からなる2層又は3層以上の積層物として形成されてよい。

【0027】樹脂基板に設けるガスバリア層は、液晶等を変質させる水分や酸素等の遮蔽を目的とし、ガスの透過を防止しうる適宜なものにて形成しうる（特開昭58-208039号公報、特開平2-169620号公報、特開平5-110639号公報）。耐久性や耐変形性等の点よりは高分子皮膜にて形成することが好ましい。その高分子としては例えばポリビニルアルコールやその部分ケン化物、エチレン・ビニルアルコール共重合体やポリアクリロニトリル、ポリ塩化ビニリデンなどの酸素透過係数が小さいポリマーが好ましく用いうる。特に、ガスバリア性や水分の拡散性ないし吸水度の均一化などの点より、ビニルアルコール系ポリマーが好ましい。

【0028】ガスバリア層の形成は、例えばキャスト方式やスピンコート方式等の適宜な塗工方式による高分子溶液の展開方式などにより行うことができる。ガスバリア層の厚さは、透明性や着色の防止、酸素や水蒸気等のガスバリア性などの点より、15 μ m以下、就中1～10 μ mが好ましい。

【0029】樹脂基板に設ける架橋樹脂層は、硬質表面を形成して視認を阻害する擦り傷の発生防止などを目的とする。従って透明な硬質膜を形成する適宜な架橋性樹

脂にて形成しうる。就中、多官能性単量体を光触媒等を介して紫外線照射により三次元架橋しうるようにした、例えばウレタンアクリル系やエポキシ系などの紫外線硬化樹脂が好ましく用いうる。

【0030】架橋樹脂層の形成は、例えばキャスト方式やスピンコート方式やディッピング方式等の適宜な塗工方式で樹脂液を所定面上に展開して架橋処理する方法などにより行うことができる。架橋樹脂層の厚さは、適宜に決定でき一般には200 μ m以下、就中100 μ m以下、特に1～50 μ mとされる。なお架橋樹脂層は通例、前記した目的の点より図例の如くガスバリア層上などのセル基板における表面層として設けられる。

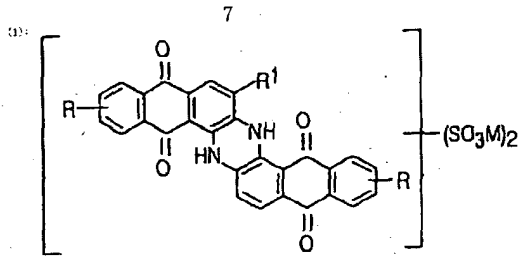
【0031】また上記したガスバリア層や架橋樹脂層は、樹脂基板の両側に設けることもできるが、通例その機能目的の点より樹脂基板の片側、特に液晶セルとした場合にセルの外表面となる側に設けられる。一方、偏光層についても樹脂基板の両側に設けうるが、通例その機能目的の点より樹脂基板の片側に設けられる。その片側に設ける場合、図例の如く偏光層4は、樹脂基板1のガスバリア層2等を有する側と有しない側のいずれにも設けることができる。また偏光層は、樹脂基板に隣接して設けることもできるし、図2に例示のガスバリア層2と架橋樹脂層3の間の如く、樹脂基板に付設する複数の層の中間位置に設けることもできる。

【0032】前記の偏光層は、液晶セル基板に偏光機能を付与することを目的とし、本発明にては可及的に層厚の薄い偏光層とするために例えばキャスト方式やスピンコート方式等の適宜な塗工方式による塗工層として形成される。セル基板の薄型化の点より偏光層の好ましい厚さは、偏光特性や耐久性等も考慮して10 μ m以下、就中0.1～5 μ m、特に0.2～3 μ mである。

【0033】従って偏光層の形成には塗工方式にて形成しうる適宜な材料を用いることができ、特に限定はない。就中、耐熱性等に優れる偏光層を得る点などよりは、リオトロピック液晶性の二色性色素や二色性染料含有の液晶ポリマー、二色性染料含有のリオトロピック性物質（例えばOptiva社製、LCポラライザー等）などが好ましく用いうる（WO97/39380号公報）。

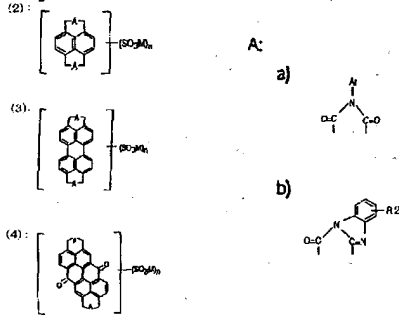
【0034】ちなみに前記したリオトロピック液晶性の二色性色素としては、例えば式：（クロモゲン）（SO₃M）_nで表される水溶性の有機色素などがあげられ、これはクロモゲンがアゾや多環式化合物等からなって液晶性を付与し、スルホン酸又はその塩が水溶性を付与して全体としてリオトロピック液晶性を示す（特表平8-511109号公報）。

【0035】なお前記した二色性色素の具体例としては、下記の式（1）～（7）で表される化合物などがあげられる。



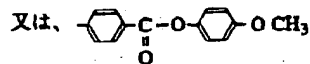
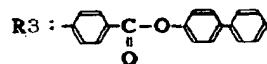
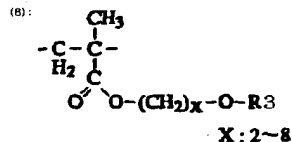
【0036】前記の式(1)において、R1は水素又は塩素であり、Rは水素、アルキル基、ArNH又はArCONHである。アルキル基としては炭素数が1~4個のもの、就中メチル基やエチル基が好ましく、アリール基(Ar)としては置換又は無置換のフェニル基、就中4位を塩素で置換したフェニル基が好ましい。またMはカチオンであり、水素イオン、LiやNa、KやCsの如き第一族金属のイオン、アンモニウムイオンなどが好ましい(以下同じ)。

【0037】



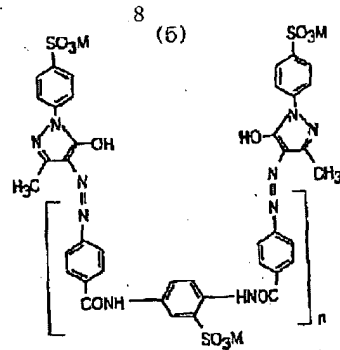
【0038】前記式(2)~(4)において、Aは式(a)又は(b)で表されるものあり、そのR2は水素、アルキル基、ハロゲン又はアルコキシ基、Arは置換又は無置換のアリール基、nは2又は3である。前記のアルキル基は炭素数が1~4個のもの、就中メチル基又はエチル基が好ましく、ハロゲンは臭素又は塩素が好ましい。またアルコキシ基は炭素数が1又は2個のもの、就中メトキシ基が好ましく、アリール基は置換又は無置換のフェニル基、就中、無置換あるいは4位をメトキシ基、エトキシ基、塩素若しくはブチル基で、又は3位をメチル基で置換したフェニル基が好ましい。

【0039】



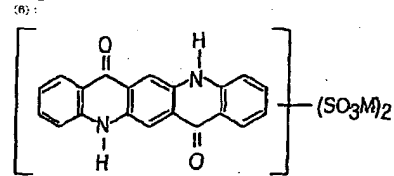
【0045】また液晶ポリマーは、下記の式(イ)~(ニ)で表される液晶モノマーの1種又は2種以上を用

いて紫外線照射により重合処理したものであってもよい(特開平11-101964号公報)。

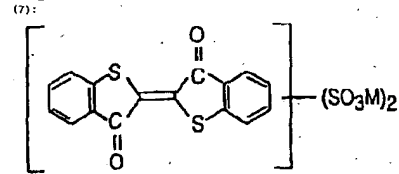


*【0040】前記の式(5)において、nは3~5が好ましい。

【0041】

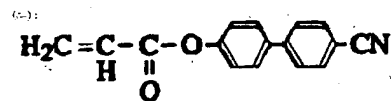
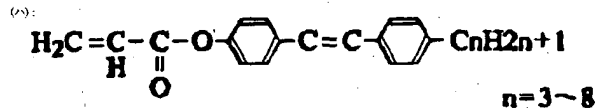
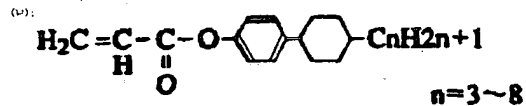
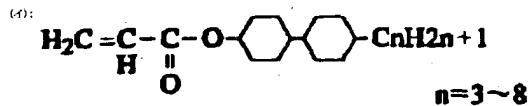


20 【0042】

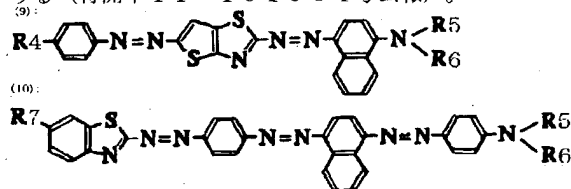


【0043】上記の式:(クロモゲン) (SO3M)nで表される有機色素は、そのクロモゲンにて安定な液晶相を示し、水やアセトン、アルコール、ジオキサンの如き水溶性有機溶媒に溶解し、その色素の1種又は2種以上を溶解させた例えば固形分濃度が1~20重量%の溶液をドクターブレード方式等の剪断力が作用する適宜な塗工方式で塗工することで配向処理でき、その配向固化層が二色性の偏光機能を示す。

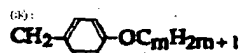
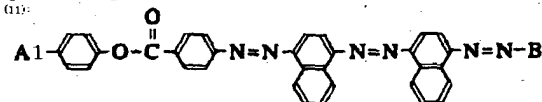
【0044】一方、上記した二色性染料を含有して偏光機能を示す液晶ポリマーとしては、一軸配向性を示す適宜なものをいう。ちなみにその例としては、下記の式(8)で表されるものなどがあげられる(特開平11-101964号公報)。



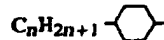
【0046】他方、液晶ポリマー層に含有させる二色性染料としても適宜なものを用いることができ、特に限定はない。耐熱性等に優れる偏光層を得る点よりは下記の式(9)～(11)で表されるものなどが好ましく用い



【0047】



【0050】他方、式(11)において、A1は $\text{C}_n\text{H}_{2n+1}$ 又は下記のものであり、そのnは1～8である。

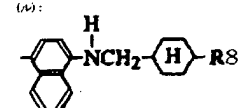
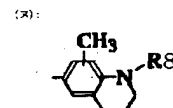
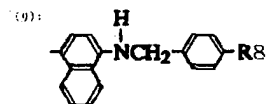
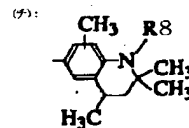


【0051】また式(11)におけるBは、下記の式(チ)～(ル)で表されるものであり、R8は $\text{C}_n\text{H}_{2n+1}$ 又は $\text{C}_n\text{H}_{2n}\text{OCH}_3$ で、そのnは1～8である。

*【0048】前記の式(9)、(10)において、R4は水素、ハロゲン、 $\text{C}_n\text{H}_{2n+1}$ 、 $\text{COC}_n\text{H}_{2n+1}$ 、 $\text{OCOC}_n\text{H}_{2n+1}$ 、 $\text{COOC}_n\text{H}_{2n+1}$ 又は $\text{CH}_2\text{COOC}_n\text{H}_{2n+1}$ である。またR5、R6は、水素又は $\text{C}_n\text{H}_{2n+1}$ であり、かつR6は下記の式(ホ)又は(ヘ)で表されるものであってもよい。さらにR5とR6はそれらで下記の式(ト)で表されるものであってもよい。一方、R7は水素、ハロゲン又は $\text{C}_n\text{H}_{2n+1}$ である。なおnは1～8で、mは1～5である。

【0049】

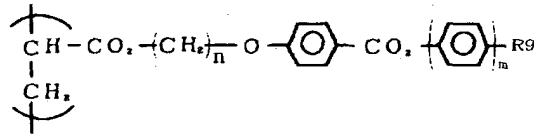
* 30



【0052】前記において偏光層の形成は、例えば1種又は2種以上の液晶ポリマーを含有する溶液に二色性染料を配合し、それを配向膜等の上に塗工して液晶ポリマーを一軸配向させる方式などにより行うことができる。液晶ポリマーの溶液化には通例、溶剤を用いて固形分濃度1～20重量%程度のものとされるが、液晶モノマーを紫外線で重合する場合には溶剤の使用を回避すること

もできる。また二色性染料は、偏光特性の波長域などに
応じて1種又は2種以上を用いることができ、その使用
量は液晶ポリマー又は液晶モノマーの1~20重量%が
一般的である。

(12):



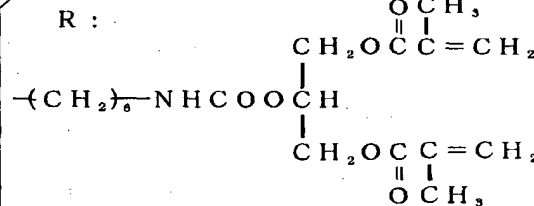
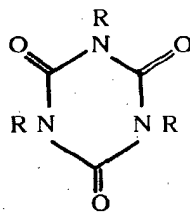
なお式中のnは1~10、R₉はシアノ基又はメトキシ
基等のアルコキシ基、mは1~5である。

【0054】本発明による液晶セル基板は、液晶表示装
置を形成するための液晶セルの形成に好ましく用い
る。その場合、本発明による液晶セル基板は液晶セルの
片側又は両側の基板として用いることができ、図1に例
示の如き基板を用いて液晶層をセル内に有するものも形
成しうるし、図2に例示の如き基板を用いて液晶層をセ
ル外に有するものも形成しうる。

【0055】また液晶セル基板の実用に際しては、例え
ば透明導電膜や位相差板等の種々の機能層を重ねること
もできる。透明導電膜の形成は、例えば酸化インジウ
ムや酸化スズ、インジウム・錫混合酸化物や金、白金や
パラジウム、透明導電塗料などの適宜な透明導電材料を
用いて、真空蒸着法やスパッタリング法等による蒸着方
式や塗料の塗工方式などの従来に準じた適宜な方式を適
用して行うことができる。

【0056】前記の透明導電膜は、偏光層の上側にも設
けることができその場合、偏光層をエッチングしてパタ
ーニングすることもできる。また偏光層の保護や透明導
電膜の密着力の向上などを目的に、例えばシリカ系ガラ
ス層や金属アルコキシドの加水分解・重縮合物層などか
らなる透明層を介在させることもできる。

【0057】なお液晶セルの形成は、例えば前記の透明※



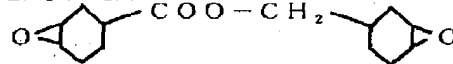
【0061】ついで前記で得た樹脂基板の反対面に、二
色性染料含有のリオトロピック液晶水溶液（Optiva
社製、LCポラライザー、固形分濃度8.7重量%）
をワイヤバー（No. 7）にてコーティング後、130
℃で乾燥させて厚さ1.3μmの偏光層を形成して、液
晶セル基板を得た。

*【0053】上記した二色性染料を含有して偏光機能を
示す液晶ポリマーの例としては、下記の式（12）で表
されるものなどもあげられる（日東技報Vol. 35, No. 1
（1997）, p. 79-82）。

※導電膜を電極パターン化した液晶セル基板を対向配置
し、その間に液晶を封入する方法などにより行うことが
できる。透明導電膜等の上に必要に応じて設けられる液
晶配列用の配向膜も従来に準じた適宜な方式にて行うこ
とができる。形成する液晶セルは、例えばTN型やST
N型、TFT型や強誘電性液晶型など任意である。

【0058】

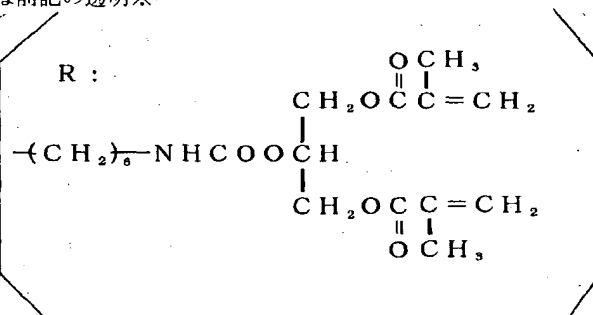
【実施例】実施例1



前記の式で表されるエポキシ系樹脂100部（重量部、
以下同じ）とメチルヘキサヒドロ無水フタル酸125部
とトリ-n-ブチルオクチルホスホニウムブロマイド1
部からなる混合物を型に注入し、120℃で2時間硬化
処理して厚さ400μmの樹脂基板を得た。

【0059】次に前記樹脂基板の片面にスピンコート方
式で、ポリビニルアルコールの5重量%水溶液を塗布
し、乾燥させて厚さ5μmのガスバリア層を形成したの
ち、その上に下式で表されるウレタンアクリル系樹脂を
塗布し、紫外線を照射して架橋処理し厚さ5μmの架橋
樹脂層を形成した。

【0060】

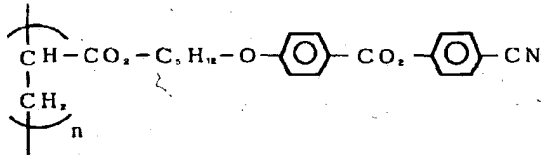


【0062】前記の液晶セル基板は、総厚が411μm
であり、波長400~700nmの波長域における光透過
率は40%で、その偏光度は90%であり、耐衝撃性に
優れたものであった。またその基板を120℃、500時
間の耐久試験に供したところ、光学特性に変化はなく、
また基板の変形等も生じなかった。

【0063】実施例 2

実施例 1 に準じ樹脂基板の片面にポリビニルアルコールからなる厚さ $5 \mu\text{m}$ のガスバリア層を形成したのち、その表面をレーヨン布でラビング処理してその上に二色性染料含有の液晶ポリマー溶液をスピコートし、 120°C で加熱配向処理して厚さ $1.5 \mu\text{m}$ の偏光層を形成し、ついでその上に実施例 1 に準じウレタンアクリル系樹脂からなる厚さ $5 \mu\text{m}$ の架橋樹脂層を形成して、液晶セル基板を得た。

【0064】前記の液晶ポリマー溶液は、下式で表される側鎖型液晶ポリマー 26 部、G-202 染料 0.37 部（日本感光色素社製、以下同じ）、G-207 染料 0.73 部及び G-472 染料 1.46 部をテトラクロロエタン 100 部にて均一に混合したものである。



【0065】前記の液晶セル基板は、総厚が $412 \mu\text{m}$ であり、波長 $400 \sim 700 \text{nm}$ の波長域における光透過率は 3.6% で、その偏光度は 8.7% であり、耐衝撃性に

【図 1】



優れものであった。またその基板を 120°C 、500 時間の耐久試験に供したところ、光学特性に変化はなく、また基板の変形等も生じなかった。

【0066】比較例

偏光層に代えて、架橋樹脂層の上に厚さ $215 \mu\text{m}$ の偏光板（日東電工社製、NPF-G1225DUN）をアクリル系粘着層を介し接着積層したほかは、実施例 1 に準じて液晶セル基板を得た。

【0067】前記の液晶セル基板は、総厚が $610 \mu\text{m}$ であり、波長 $400 \sim 700 \text{nm}$ の波長域における光透過率は 3.8% で、その偏光度は 9.9% であった。またその基板を 120°C 、500 時間の耐久試験に供したところ、偏光板が基板より剥離して実用に供せないものとなった。

【図面の簡単な説明】

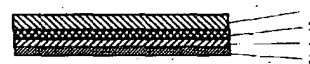
【図 1】実施例の断面図

【図 2】他の実施例の断面図

【符号の説明】

- 1 : 樹脂基板
2 : ガスバリア層
3 : 架橋樹脂層
4 : 偏光層

【図 2】



フロントページの続き

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F ターム (参考) 2H049 BA02 BA26 BA42 BB42 BB44
BB62 BC10
2H090 JA06 JA07 JB03 JC07 JD11
LA09 MB01
2H091 FA07X FA07Z FB02 FD06
GA01 GA16 LA02 LA04 LA06
4J002 BF051 BG031 BG042 BG071
BG072 CD051 CD061 CD071
CD111 CD131 CD141 CF211
CG001 CL001 CM041 CN031
EV256 FD096 GP00 GS00

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CLAIMS

[Claim(s)]

[Claim 1] The liquid crystal cell substrate to which it comes to carry out the adhesion attachment of a gas barrier layer, a bridge formation resin layer, and the polarization layer at least, and the polarization layer is characterized by the bird clapper from a coating layer at a resin substrate.

[Claim 2] The liquid crystal cell substrate which a resin substrate turns into from a heat-curing epoxy system resin in a claim 1.

[Claim 3] The liquid crystal cell substrate whose polarization layer thickness is 5 micrometers or less in a claim 1 or 2.

[Claim 4] The liquid crystal cell substrate which a polarization layer becomes from the dichroism coloring matter of lyotropic-liquid-crystal nature, the liquid crystal polymer layer of dichromatic-dye content, or the RIOTORO pick nature matter of dichromatic-dye content in claims 1-3.

[Claim 5] The liquid crystal cell substrate which a polarization layer adjoins one side of a resin substrate, or is located between a gas barrier layer and a bridge formation resin layer in claims 1-4.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the liquid crystal cell substrate of the resin system which is excellent in thermal resistance, moisture resistance, gas barrier property, endurance, thin shape lightweight nature, etc., and has a suitable polarization function for formation of a liquid crystal display.

[0002]

[Description of the Prior Art] Conventionally, as a liquid crystal cell which has a polarization function, what carried out the adhesion laminating of the polarizing plate of a polarization film system to the cell substrate was known. Although there is also a proposal using the resin substrate which replaces with the glass substrate which is heavy to the cell substrate and is easy to be broken into it with big-screen-izing, and is excellent in thin shape lightweight nature. In this case, since the aforementioned polarizing plate has five layer structures which come to attach a transparent protection film to both sides of a polarization film through a glue line and is the total thickness of 100 micrometers or more usually, even if alike, In addition to lightweight nature, thin shape nature was not fully harnessed, either, and the thermal resistance of a polarization film was insufficient, and there was a trouble with difficult use at 100 degrees C or more.

[0003]

[The technical technical problem of invention] this invention makes a technical problem development of the liquid crystal cell substrate which has the polarization function which can form the liquid crystal cell substrate which is excellent in thin shape lightweight nature and thermal resistance, and is excellent in shock resistance or the stability of quality.

[0004]

[Means for Solving the Problem] this invention offers the liquid crystal cell substrate to which it comes to carry out the adhesion attachment of a gas barrier layer, a bridge formation resin layer, and the polarization layer at least, and the polarization layer is characterized by the bird clapper from a coating layer at a resin substrate.

[0005]

[Effect of the Invention] According to this invention, the polarization layer which is excellent in thinness and thermal resistance with a coating method can be given to a resin substrate, and the liquid crystal cell substrate of high endurance which can form the liquid crystal cell which can also give easily a gas barrier layer and a bridge formation resin layer, can manufacture efficiently, is excellent also in thin shape lightweight nature or thermal resistance in addition to moisture-proof and gas-proof nature, or shock resistance, and is excellent in the long term stability of display grace and which has a polarization function can be obtained.

[0006]

[The operation gestalt of invention] The liquid crystal cell substrate by this invention consists of what carried out the adhesion attachment of the polarization layer which becomes a resin substrate from a gas barrier layer, a bridge formation resin layer, and a coating layer at least. The example was shown in drawing 1 and drawing 2. For a resin substrate and 2, a gas barrier layer and 3 are [1 / a bridge formation resin layer and 4] polarization layers.

[0007] A resin substrate serves as the base of the cell substrate which supports attachment layers, such as a gas barrier layer, and can be formed by proper resins, such as thermoplastics and thermosetting resin. Especially as for the resin substrate which can be used more preferably than points at the time of attaching a polarization layer, a transparent electric conduction film, etc., such as thermal resistance, 130 degrees C or more of 150 degrees C or more of glass transition temperatures consist of a resin 160 degrees C or more above all.

[0008] Moreover, as for a resin substrate, excelling in transparency or shock resistance is desirable, and that [its] especially whose light transmittance is 80% or more is desirable. What is excellent in gas barrier property, such as

chemical resistance, optical isotropy, low absorptivity, low moisture permeability, and oxygen, is more desirable than points, such as endurance at the time of furthermore considering as transformation prevention and the liquid crystal cell of liquid crystal.

[0009] As an example of the resin used for formation of a resin substrate, the thermosetting resin like thermoplastics, an epoxy system resin, a unsaturated polyester and the poly diallyl phthalate, or poly ISOBO nil methacrylate like a polycarbonate, a polyarylate and polyether sulphone, polyester, a polysulfone, a polymethylmethacrylate and polyether imide, or a polyamide etc. is raised. One sort or two sorts or more can be mixed and used for this resin.

[0010] The resin substrate which can be used more preferably than the point of the above-mentioned performance consists of an epoxy system resin. Various things can be used as the epoxy system resin, and there is especially no limitation. Incidentally as the example, the low water-absorption type like the aromatic type like a bisphenol A type, bisphenol female mold, bisphenol type [like bisphenol S types or those hydrogenation types], novolak type [like a phenol novolak type or a cresol novolak type], nitrogen ring type [like a triglycidyl isocyanurate type or a hydantoin type], alicyclic type, aliphatic type, and naphthalene type, a glycidyl ether type, and a biphenyl type, a JISHIKURO type, an ester type, ether ester types, those denatured types, etc. are

[0011] The discoloration tightness of the epoxy system resin which can be used more preferably than points, such as optical properties, such as transparency, is good like an alicyclic type thing, without containing conjugated double bond, such as the benzene ring. Moreover, a weight per epoxy equivalent can use [softening temperature] by 100-1000 usually more preferably than the points that an epoxy system resin 120 degrees C or less is obtained, such as physical properties, such as the flexibility of a resin substrate, and intensity. One sort or two sorts or more can be used for an epoxy system resin, and it can also use an epoxy solid-like system resin together as it is liquefied. Intensity and heat-resistant improvement can be aimed at by combined use of a solid epoxy system resin.

[0012] Especially the resin substrate that consists of a desirable epoxy system resin carries out heat-curing processing of the epoxy system resin through a curing agent like the heat-hardening object of for example, an alicyclic epoxy system resin, an acid-anhydride system curing agent, and the epoxy system constituent containing the Lynn system curing catalyst from points, such as thermal resistance. the proper curing agent there is especially no limitation about the curing agent, and corresponding to the epoxy system resin -- one sort -- or two or more sorts can be used

[0013] Incidentally as an example of the aforementioned curing agent, the amine system compounds like the organic-acid system compounds like a tetrahydrophthal acid, a methyl tetrahydrophthal acid, hexahydrophthalic acid, or methyl hexahydrophthalic acid, ethylenediamine and a propylenediamine, a diethylenetriamine, triethylenetetramines and those amine adducts, a meta-phenylenediamine and a diamino diphenylmethane, or a diaminodiphenyl sulfone are raised.

[0014] Moreover, the imidazole system compounds like the amide system compounds like a dicyandiamide or a polyamide, the **** hydrazide system compounds of JIHIDORAJITTO, a methyl imidazole and a 2-ethyl-4-methyl imidazole, an ethyl imidazole and an isopropyl imidazole, 2, 4-dimethyl imidazole and a phenyl imidazole, a undecyl imidazole and heptadecyl imidazole, and a 2-phenyl-4-methyl imidazole are raised as an example of the aforementioned curing agent.

[0015] Furthermore, the imidazoline system compounds like methyl imidazoline, 2-ethyl-4-methyl imidazoline, ethyl imidazoline and isopropyl imidazoline, 2, 4-dimethyl imidazoline and phenyl imidazoline, undecyl imidazoline and heptadecyl imidazoline, and 2-phenyl-4-methyl imidazoline, other phenol system compounds and urea system compounds, and polysulfide system compounds are raised as an example of the aforementioned curing agent.

[0016] In addition, acid-anhydride system compounds are raised as an example of the aforementioned curing agent, and this acid-anhydride system curing agent can use it preferably rather than points, such as work-environment nature by low stimulative one, elevated-temperature endurance by the heat-resistant improvement in a hardening layer obtained, and discoloration tightness. As the example, a phthalic anhydride, maleic-anhydride, trimellitic anhydride and pyromellitic dianhydride, anhydrous NAJIKKU acid, anhydrous glutaric-acid, and tetrahydrophthal acid anhydride, a methyl tetrahydrophthal acid anhydride, a hexahydrophthalic acid anhydride and a methyl hexahydrophthalic acid anhydride, a methyl NAJIKKU acid anhydride and a dodecenyl succinic-acid anhydride, a dichlorosuccinic-acid anhydride, a benzophenone tetracarboxylic acid anhydride, a KUROREN Dick acid anhydride, etc. are raised.

[0017] Above all, the acid-anhydride system curing agent of about 140 - abbreviation 200 can use [molecular weight] preferably by the colorless system or the light yellow system like phthalic anhydride, a tetrahydrophthal acid anhydride and a hexahydrophthalic acid anhydride, or a methyl hexahydrophthalic acid anhydride.

[0018] The amount of the curing agent used can be suitably determined according to the kind, the weight per epoxy equivalent of an epoxy system resin, etc., and, in usual epoxy system resin hardening, may apply correspondingly. Incidentally it is more desirable than points acquired in the aforementioned acid-anhydride system curing agent, such as a hue of a hardening layer, and damp-proof fall prevention, to use especially 0.5-1.5Eq of 0.6-1.4Eq of acid-

anhydride system curing agents at a rate of 0.7-1.2Eq above all to 1Eq of epoxy groups. In addition, it is independent in other curing agents, or when using together and using two or more sorts, the amount used may apply to the aforementioned equivalent ratio correspondingly.

[0019] On the occasion of hardening processing of an epoxy system resin, a hardening accelerator can be used if needed. the hardening accelerator -- especially -- limitation -- there is nothing -- an epoxy system resin, the kind of curing agent, etc. -- responding -- for example, the proper thing like tertiary amines, imidazole derivatives, quarternary ammonium salt and organic-metal salts, phosphorus compounds, and a urea system compound class -- one sort -- or two or more sorts can be used A cure rate can be promoted by use of a hardening accelerator, and the required hardening processing time can be shortened. therefore -- although the amount of the hardening accelerator used can be suitably determined according to a facilitatory effect etc. -- general -- points, such as discoloration tightness, -- per epoxy system resin 100 weight section and 0.05 - 7 weight section -- above all -- 0.1 - 5 weight section -- 0.2 - 3 weight section is especially desirable

[0020] A method with for example, a casting fabrication method, a flow casting fabrication method, an injection-molding method and a roll coating fabrication method, an extrusion-molding method, proper transfer-molding method, reaction-injection-molding method (RIM), etc. can perform formation of a resin substrate. On the occasion of the formation, proper additives, such as a color, a modifier, an antitarnish agent and an antioxidant, an ultraviolet ray absorbent and a release agent, a reactant diluent, and a non-reactivity diluent, can be suitably blended in the range which does not spoil transparency if needed.

[0021] The manufacture method of excelling in the mass-production nature of the resin substrate which consists of an epoxy system resin is the method of developing the epoxy system resin coating liquid which prepared for example, the combination component in the state where of a solvent is used together if needed and flow expansion can be carried out in the shape of a sheet on base materials, such as an endless belt and a drum, by proper methods, such as the curtain coat method, the roll coat method, the wire bar coat method, and the extrusion coat method, a spray coating method, and carrying out hardening

[0022] According to the aforementioned method, continuation manufacture of the resin substrate top which consists of an epoxy system resin can be carried out. In this case, recovery of the epoxy system resin substrate formed on the base material can be attained by forming the resin layer of easy-releasability etc. beforehand for example, on a base material, and preparing an epoxy system resin substrate on it, and can form efficiently the liquid crystal cell substrate by this invention by preparing a bridge formation resin layer, a gas barrier layer, etc. which are prepared on a resin substrate in that case as an easy-releasability resin layer.

[0023] On the occasion of manufacture of the above-mentioned epoxy system resin coating liquid, the epoxy system resin of a 2 liquid hybrid model in which a liquid state is shown in below the temperature at the time of coating, especially ordinary temperature from points, such as coating nature and sheet-like expansion nature, is used preferably, a solid epoxy system resin can be used together in that case, the viscosity of coating liquid can be adjusted, and expansion layer thickness control etc. can also be easy-ized by hyperviscosity-ization of coating liquid.

[0024] In addition, one sort of the curing catalyst like the Lynn system curing catalysts, such as alkylphosphine to the acid-anhydride system curing agent described above, for example, and phosphine oxide and phosphonium salt, and the proper leveling agent in which the surface tension of various surfactants, such as for example, a silicone system, and acrylic, a fluorine system, etc. is reduced for the purpose of surface smoothing, and it deals, or two sorts or more can be blended with epoxy system resin coating liquid if needed.

[0025] Moreover, the proper additive by which have been blended with epoxy system resin hardening objects, such as antifoaming agents, such as polyhydric alcohol like modifiers, such as antioxidants, such as a phenol system, an amine system, an organic-sulfur system, and a phosphine system, glycols, and silicone, alcohols, and a glycerol, a hydroxyl-group content compound and a color, and an antitarnish agent, an ultraviolet ray absorbent, for example can also be blended if needed.

[0026] Especially generally 100-500 micrometers is more desirable [thickness] than points, such as thin-shape-izing, lightweight nature and intensity, and deformation tightness, although the thickness of a resin substrate can be determined suitably 800 micrometers or less above all 1mm or less. Moreover, excelling in thickness precision is desirable and it is more desirable than points, such as display grace, that it is **10% or less of thickness precision above all. In addition, the resin substrate may be formed as a laminated material of two-layer [which consists of a monolayer object or a resin of the same kind or of a different kind], or three layers or more.

[0027] The gas barrier layer prepared in a resin substrate can be formed in the proper thing which can prevent transparency of gas for the purpose of cover of moisture, oxygen, etc. in which liquid crystal etc. is deteriorated and it deals (JP,58-208039,A, JP,2-169620,A, JP,5-110639,A). Forming in a macromolecule coat is more desirable than points, such as endurance and deformation resistance. Polymer with oxygen transmission coefficients small as the

macromolecule, such as polyvinyl alcohol, the partial saponification object and an ethylene vinyl alcohol copolymer, and a polyacrylonitrile, a polyvinylidene chloride, can use preferably. Especially, vinyl alcohol system polymer is more desirable than points, such as gas barrier property, the diffusibility of moisture, or equalization of water absorbing capacity.

[0028] The expansion method of the polymer solution by the coating method with proper for example, casting method, spin coat method, etc. can perform formation of a gas barrier layer. Gas barrier layer thickness has 1-10 micrometers more desirable than points, such as gas barrier property, such as prevention of transparency and coloring, oxygen, and a steam, above all 15 micrometers or less.

[0029] The bridge formation resin layer prepared in a resin substrate aims at generating prevention of the abrasion which forms a hard front face and checks a check by looking etc. Therefore, it can form by the proper cross-linking resin which forms a transparent hard film. Above all, it enabled it to carry out three-dimensions bridge formation of the polyfunctional monomer by UV irradiation through a photocatalyst etc., for example, ultraviolet-rays hardening resin, such as urethane acrylic and an epoxy system, can use preferably.

[0030] Formation of a bridge formation resin layer can be performed by the method of developing resin liquid on a predetermined side and carrying out bridge formation processing by the coating method with proper for example, casting method, spin coat method, dipping method, etc., etc. Bridge formation resin layer thickness can be determined suitably, and, especially generally is set to 1-50 micrometers 100 micrometers or less above all 200 micrometers or less. In addition, a bridge formation resin layer is usually prepared as a surface layer in the cell substrates on a gas barrier layer etc. like the example of drawing from said target point.

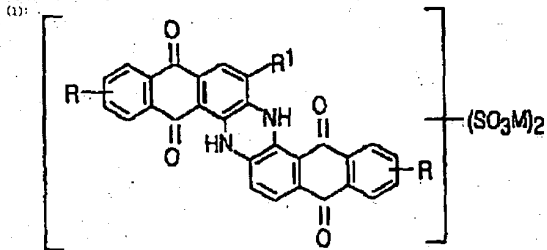
[0031] Moreover, although the above-mentioned gas barrier layer and the above-mentioned bridge formation resin layer can also be prepared in the both sides of a resin substrate, when it considers as one side of a resin substrate, especially a liquid crystal cell more nearly usually than the point of the functional purpose, they are prepared in the side used as the outside surface of a cell. On the other hand, although it can prepare in the both sides of a resin substrate also about a polarization layer, it is usually prepared in one side of a resin substrate from the point of the functional purpose. When preparing in the one side, the polarization layer 4 can be formed in all of the side which it does not have [that has the gas barrier layer 2 grade of the resin substrate 1, and] like the example of drawing. Moreover, a polarization layer can adjoin a resin substrate, can also be prepared and can also be prepared in the mid-position of two or more layers attached to a resin substrate like between the gas barrier layer 2 of the instantiation to drawing 2, and the bridge formation resin layers 3.

[0032] The aforementioned polarization layer is formed as a coating layer by the coating method with proper casting method, spin coat method, etc., in order to consider as the thin polarization layer of thickness as much as possible in this invention for the purpose of giving a polarization function to a liquid crystal cell substrate. The thickness with a polarization layer more desirable than the point of thin-shape-izing of a cell substrate takes a polarization property, endurance, etc. into consideration, and is 0.2-3 micrometers especially 0.1-5 micrometers above all 10 micrometers or less.

[0033] Therefore, a proper material which can be formed by the coating method can be used for formation of a polarization layer, and there is especially no limitation. The dichroism coloring matter of lyotropic-liquid-crystal nature, the liquid crystal polymer of dichromatic-dye content, the RIOTORO pick nature matter (for example, the product made from Optiva, LC polarizer, etc.) of dichromatic-dye content, etc. can use preferably from the point of obtaining above all the polarization layer which is excellent in thermal resistance etc. (WO 97/No. 39380 official report).

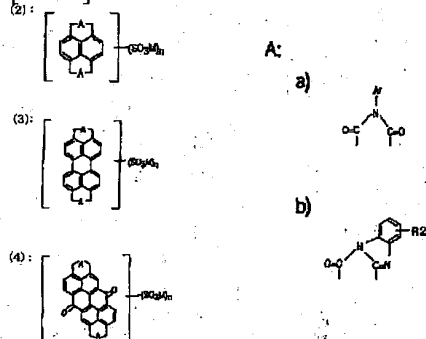
[0034] As dichroism coloring matter of lyotropic-liquid-crystal nature incidentally described above, the water-soluble organic coloring matter expressed with formula:(chromogen) (SO₃M) n, for example is raised, a chromogen consists of azo, a polycyclic compound, etc., mesomorphism is given, a sulfonic acid or its salt gives water solubility, and this shows lyotropic-liquid-crystal nature as a whole (***** No. 511109 [eight to] official report).

[0035] In addition, the compound expressed with following formula (1) - (7) as an example of said dichroism coloring matter is raised.



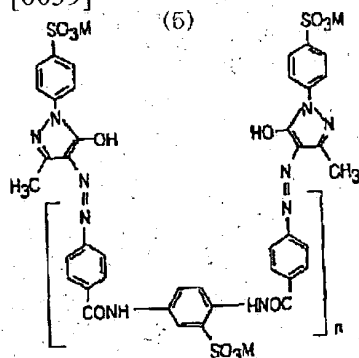
[0036] In the aforementioned formula (1), R1 is hydrogen or chlorine and R is hydrogen, an alkyl group, ArNH, or ArCONH. as an alkyl group -- a carbon number -- 1-4 things -- a methyl group and an ethyl group are desirable above all, and the phenyl group which is not replaced [substitution or] and the phenyl group which replaced the 4th place by chlorine above all are desirable as an aryl group (Ar) Moreover, M is a cation and the ion of the first group metal like a hydrogen ion, Li and Na, K, or Cs, an ammonium ion, etc. are desirable (it is below the same).

[0037]



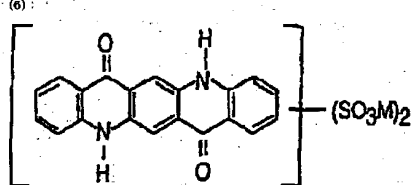
[0038] The aforementioned formula (2) In - (4), those with a thing to which A is expressed with a formula (a) or (b), and its R2 are [the aryl group which is not replaced / substitution or / and n of hydrogen, an alkyl group a halogen or an alkoxy group, and Ar] 2 or 3. the aforementioned alkyl group -- a carbon number -- 1-4 things -- a methyl group or an ethyl group is desirable above all, and a bromine or chlorine of a halogen is desirable moreover, an alkoxy group -- a carbon number -- 1 or two things -- a methoxy machine is desirable above all and the phenyl group which is not replaced [substitution or] and the phenyl group of an aryl group which is a methoxy machine, an ethoxy basis, chlorine, or a butyl about no replacing or the 4th place, or replaced the 3rd place by the methyl group above all are desirable

[0039]

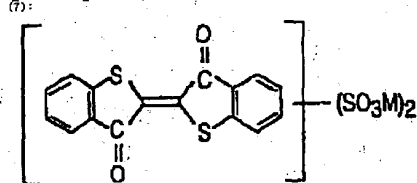


[0040] As for n, in the aforementioned formula (5), 3-5 are desirable.

[0041]



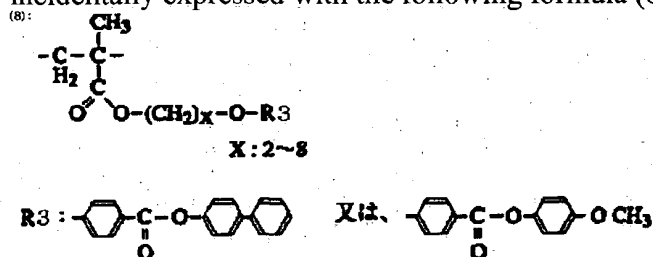
[0042]



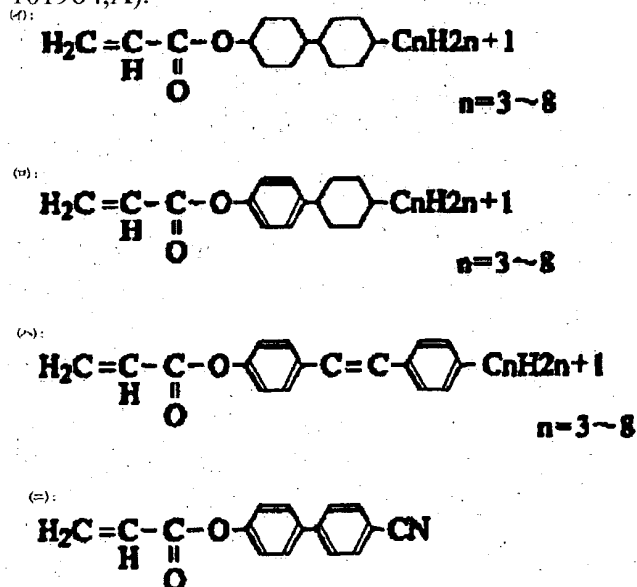
[0043] The above-mentioned formula : (chromogen) (SO3M) the organic coloring matter expressed with n A liquid crystal phase stable at the chromogen is shown. Water, an acetone, alcohol, Orientation processing can be carried out

by carrying out coating of the solution in which it dissolved in the water-soluble organic solvent like a dioxane, and one sort of the coloring matter or two sorts or more were dissolved and whose solid-content concentration is 1 - 20 % of the weight, for example by the proper coating method on which shearing force, such as a doctor blade method, acts. The orientation solidification layer shows the polarization function of dichroism.

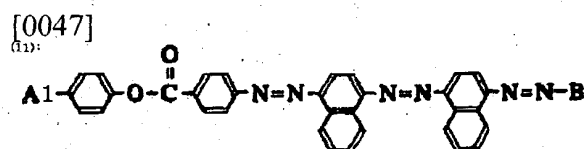
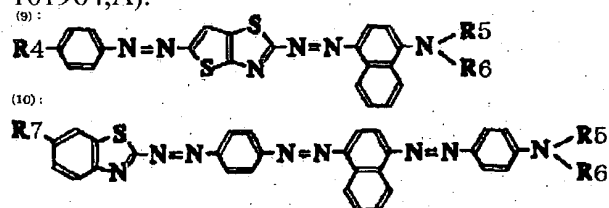
[0044] As a liquid crystal polymer which, on the other hand, contains the above-mentioned dichromatic dye, and shows a polarization function, the proper thing which shows uniaxial orientation nature can be used. What is incidentally expressed with the following formula (8) as the example is raised (JP,11-101964,A).



[0045] Moreover, you may carry out polymerization of the liquid crystal polymer by UV irradiation using one sort of the liquid crystal monomer which are following formula (**) - (**) and is expressed, or two sorts or more (JP,11-101964,A).



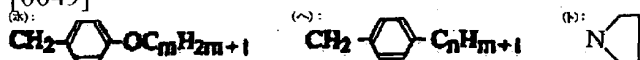
[0046] On the other hand, a thing proper also as a dichromatic dye which a liquid crystal polymer layer is made to contain can be used, and there is especially no limitation. What is expressed with following formula (9) - (11) rather than the point of obtaining the polarization layer which is excellent in thermal resistance etc. can use preferably (JP,11-101964,A).



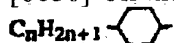
[0048] In the aforementioned formula (9) and (10), R4 is hydrogen, a halogen, CnH2n+1, COCnH2n+1, OCOcH2n+1, COOCnH2n+1, or CH2COOCnH2n+1. Moreover, R5 and R6 may be hydrogen or CnH2n+1, and R6

may be following formula (**) or (passing) a thing expressed. Furthermore, R5 and R6 may be expressed with the formula (g) of the following [them]. On the other hand, R7 is hydrogen, a halogen, or C_nH_{2n+1} . In addition, n is 1-8 and m is 1-5.

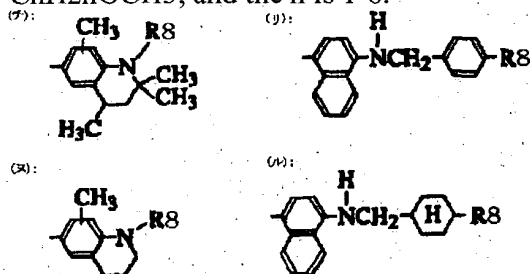
[0049]



[0050] On the other hand, in a formula (11), A1 is C_nH_{2n+1} or as follows, and the n is 1-8.

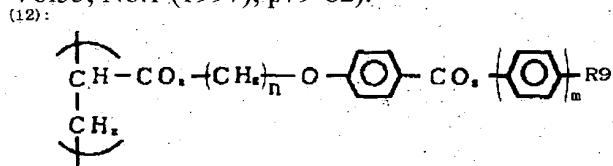


[0051] Moreover, B in a formula (11) is expressed with a following formula (h) - a (**), R8 is C_nH_{2n+1} or $C_nH_{2n}OCH_3$, and the n is 1-8.



[0052] In the above, formation of a polarization layer can blend a dichromatic dye with the solution containing one sort or two sorts or more of liquid crystal polymers, and the method to which coating of it is carried out on an orientation film etc., and uniaxial orientation of the liquid crystal polymer is carried out can perform it. Although it considers as the thing of about 1 - 20 % of the weight of solid-content concentration usually at solution-ization of a liquid crystal polymer using a solvent, use of a solvent can also be avoided when carrying out the polymerization of the liquid crystal monomer by ultraviolet rays. Moreover, according to the wavelength region of a polarization property etc., one sort or two sorts or more can be used for a dichromatic dye, and a liquid crystal polymer or 1 - 20% of the weight of the liquid crystal monomer of the amount used is common.

[0053] As an example of the liquid crystal polymer which contains the above-mentioned dichromatic dye and shows a polarization function, what is expressed with the following formula (12) is raised (the Japanese east technical report Vol35, No.1 (1997), p79-82).



In addition, n in a formula is [alkoxy groups, such as a cyano group or a methoxy machine, and m of 1-10, and R9] 1-5.

[0054] The liquid crystal cell substrate by this invention can be preferably used for formation of the liquid crystal cell for forming a liquid crystal display. In this case, the liquid crystal cell substrate by this invention forms what can use as a substrate of one side of a liquid crystal cell, or both sides, uses the substrate like instantiation for drawing 1, and has a liquid crystal layer in a cell, and can form what uses the substrate like instantiation for Japanese lacquer and drawing 2, and has a liquid crystal layer out of a cell.

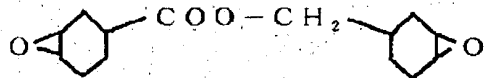
[0055] Moreover, on the occasion of practical use of a liquid crystal cell substrate, various functional layers, such as a transparent electric conduction film and a phase contrast board, can also be superimposed, for example. Formation of a transparent electric conduction film can be performed with the application of the proper method according to the former by the vacuum deposition method, the sputtering method, etc., such as a vacuum evaporation method and a coating method of a paint, using proper transparent electrical conducting materials, such as indium oxide, tin oxide, an indium and tin mixed-oxide metallurgy, platinum, and palladium, transparent conductive coating material.

[0056] The aforementioned transparent electric conduction film can be prepared also in the polarization layer bottom, and can also ***** and carry out patterning of the polarization layer in that case. Moreover, the stratum lucidum which consists of hydrolysis, a heavy condensate layer, etc. of for example, a silica system glass layer metallurgy group alkoxide can also be made to intervene for the purpose of protection of a polarization layer, improvement in the

adhesion force of a transparent electric conduction film, etc.

[0057] In addition, formation of a liquid crystal cell can carry out opposite arrangement of the liquid crystal cell substrate which carried out the electrode patternizing of the aforementioned transparent electric conduction film, and can be performed by the method of enclosing liquid crystal between them etc. The proper method according to the former can also perform the orientation film for a liquid crystal array prepared if needed on a transparent electric conduction film etc. The liquid crystal cells to form are arbitration, such as TN type, a STN type, and a TFT type, a ferroelectric liquid crystal type.

[0058]

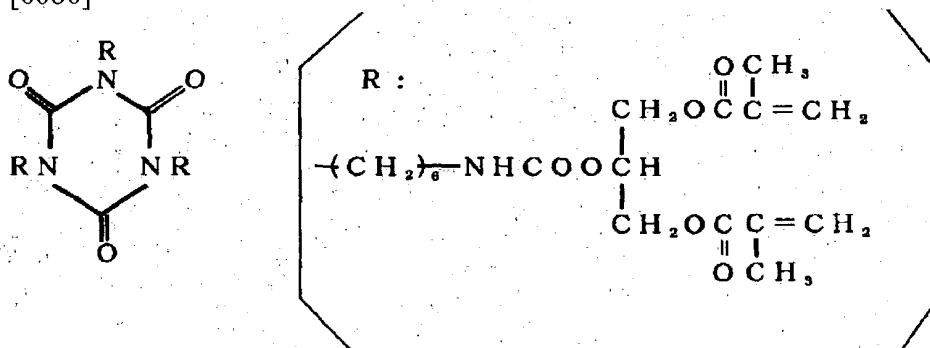


[Example] Example 1

The mixture which consists of the epoxy system resin 100 section (it is the same the weight section and the following) and the methyl hexahydro phthalic anhydride 125 section which are expressed with the aforementioned formula, and the tree n-butyl octyl phosphonium star's picture 1 section was poured into the mold, hardening processing was carried out at 120 degrees C for 2 hours, and the resin substrate with a thickness of 400 micrometers was obtained.

[0059] Next, after applying the 5-% of the weight solution of polyvinyl alcohol to one side of the aforementioned resin substrate, making it dry on it and forming a gas barrier layer with a thickness of 5 micrometers in it by the spin coat method, on it, the urethane acrylic resin expressed with a lower formula was applied, ultraviolet rays were irradiated, bridge formation processing was carried out and the bridge formation resin layer with a thickness of 5 micrometers was formed.

[0060]

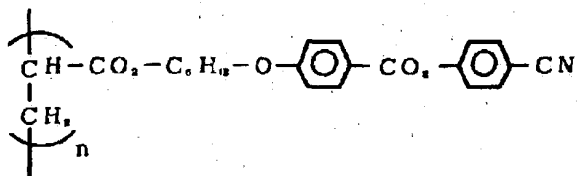


[0061] Subsequently, the opposite side of the resin substrate obtained above was made to dry the lyotropic-liquid-crystal solution (the product made from Optiva, LC polarizer, 8.7 % of the weight of solid-content concentration) of dichromatic-dye content at 130 degrees C after coating with a wire bar (No.7), the polarization layer with a thickness of 1.3 micrometers was formed in it, and the liquid crystal cell substrate was obtained.

[0062] It was 90%, and the light transmittance in the wavelength region whose total thickness the aforementioned liquid crystal cell substrate is 411 micrometers, and is the wavelength of 400-700nm is 40%, and it was [the degree of polarization was excellent in shock resistance, and] a thing. Moreover, when 120 degrees C and the durability test of 500 hours were presented with the substrate, it is changeless to an optical property, and deformation of a substrate etc. was not produced.

[0063] After forming a gas barrier layer with a thickness of 5 micrometers it is thin on one side of a resin substrate from polyvinyl alcohol according to example 2 example 1, Carry out rubbing processing of the front face with a rayon cloth, and the spin coat of the liquid crystal polymer solution of dichromatic-dye content is carried out on it. Heating orientation processing was carried out at 120 degrees C, the polarization layer with a thickness of 1.5 micrometers was formed, subsequently the bridge formation resin layer with a thickness of 5 micrometers it is thin from an urethane acrylic resin according to an example 1 was formed on it, and the liquid crystal cell substrate was obtained.

[0064] The aforementioned liquid crystal polymer solution mixes uniformly the side-chain type liquid crystal polymer 26 section expressed with a lower formula, the G-202 color 0.37 section (it is the same Japanese sensitizing-dye company make and the following), the G-207 color 0.73 section, and the G-472 color 1.46 section in the tetrachloroethane 100 section.



[0065] It was 87%, and the light transmittance in the wavelength region whose total thickness the aforementioned liquid crystal cell substrate is 412 micrometers, and is the wavelength of 400-700nm is 36%, and it was [the degree of polarization was excellent in shock resistance, and] a thing. Moreover, when 120 degrees C and the durability test of 500 hours were presented with the substrate, it is changeless to an optical property, and deformation of a substrate etc. was not produced.

[0066] Replaced with the example polarization layer of comparison, and the adhesion laminating of the polarizing plate (the NITTO DENKO CORP. make, NPF-G1225DUN) with a thickness of 215 micrometers was carried out through the acrylic adhesive layer on the bridge formation resin layer, and also the liquid crystal cell substrate was obtained according to the example 1.

[0067] The light transmittance in the wavelength region whose total thickness the aforementioned liquid crystal cell substrate is 610 micrometers, and is the wavelength of 400-700nm was 38%, and the degree of polarization was 99%. Moreover, when 120 degrees C and the durability test of 500 hours were presented with the substrate, the polarizing plate became what exfoliates from a substrate and is not in practical use ****.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]